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Selection of inbred lines and their correspondent hybrids under ultra-spaced and highly dense at normal and water-stress conditions

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Abstract

Water stress is one of the most important environmental stresses around the world for many crop species and especially for maize. In addition, climate changes and increasing population pose serious challenges to crop improvement for increasing crop yield. Tolerance to drought is a complex quantitative trait controlled by several small effect genes or QTLs and is often confounded by differences in plants phenology. The present study aimed to investigate the tolerance of inbred lines and their correspondent hybrids using agronomic and physiological characteristics. Therefore, we used thirty one maize inbred lines under ultra-spaced and highly dense conditions and under two different water regimes (normal and drought conditions) in three different areas in Greece during the 2012 growing season. After the first year of experimentation the inbred lines were divided into three different groups tolerant, moderate sensitive and sensitive to water stress and specific hybrids from the combination of the different groups were evaluated under two water regimes and under ultra-spaced and highly dense stands and in three locations during the 2013 growing season. The inbred lines and the hybrids were evaluated using a number of physiological (gas exchange parameters, chlorophyll meter readings, chlorophyll fluorescence, water potential,

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relative water content) and agronomic traits (grain yield, harvest index and yield components). The results showed that assimilation rate was reduced by the water stress at all locations and in inbred lines and also in hybrids. In addition, harvest index, instantaneous water use efficiency, and anthesis to silking interval were affected by the water stress in both the inbred lines and the hybrids. There was a clear sign that some physiological and agronomic characteristics can be used for the selection of stress-adaptive genotypes and may allow the development of new maize hybrids from specific crosses that can be grown under different conditions addressing the climate change scenarios.

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Keywords: maize, drought, breeding, physiology, grain yield.

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